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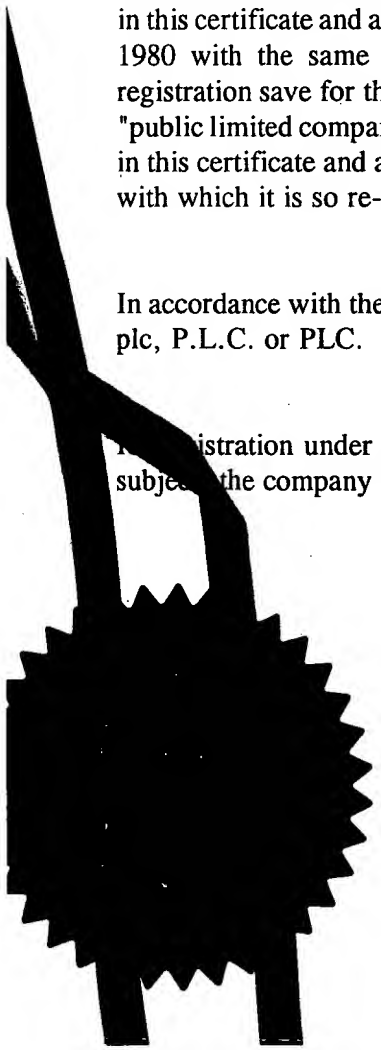

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Patents Form 1/77

Patents Act 1977

26 JAN 2001

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Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
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1. Your reference — AT-G30479

2. Patent application number *(The Patent Office will fill in this part)* — **0102041.1**

26JAN01 E601053-3 D00546
P01/7700 0.00-0102041.1

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Pace Micro Technology Plc

Victoria Road
Saltaire
Shipley
BD18 3LF

Patents ADP number *(if you know it)* 69052930001

If the applicant is a corporate body, give the country/state of its incorporation — **U.K**

4. Title of the invention — **Broadcast Data Receiver**

5. Name of your agent *(if you have one)* — **Bailey Walsh & Co.**

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

5, York Place
Leeds
LS1 2SD

Patents ADP number *(if you know it)* — **224001**

6. If you are declaring priority from one or more earlier patent applications, give the and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / years)*

7. If this application is divided or otherwise derived from an earlier UK application, the earlier application

Number of earlier application	Date of filing *(day / month / years)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer "Yes" if:*

a) any applicant named in part 3 is not an inventor, or

b) there is an inventor who is not named as an applicant, or

c) any named applicant is a corporate body

See note (d)

Yes

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9. [redacted]er the number of sheets for any of the [redacted]owing items you are filing with this form. [redacted]o not count copies of the same document.

Continuation sheets of this form	
Description	7 ✓ Wm
Claim(s)	-
Abstract	-
Drawing(s)	-

10. If you are also filing any of the following, state how many of each item.

Priority Documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(Please specify)*	

11. I/We request the grant of a patent on the basis of this application

Signature [signature] Date **25.01.01**

12. Name and daytime telephone number of person to contact in the United Kingdom

A Tomkinson
0113 2433824

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Notes

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Broadcast Data Receiver

This invention relates to a broadcast data receiver for use with a television system.

The television system referred to in the following description includes a display screen and a broadcast data receiver. The broadcast data receiver (BDR) allows for the generation of audio, visual and auxiliary data from digital data received from a broadcaster. In normal operation, a BDR receiving digital data will derive accurate frequency information from a stable reference embedded in the broadcast data stream.

BDR's typically contain a voltage controlled crystal oscillator (VCXO) generating a local frequency which is usually varied by up to +/- 100ppm about a nominal frequency, typically 27MHz. Off air MPEG transport stream/broadcast data streams have stable reference control signals embedded therein which are common to a 90KHz system clock reference (SCR). The microprocessor of a BDR produces a suitable pulse width modulated (PWM) waveform based on the SCR value to control the VCXO. An accurate VCXO frequency allows accurate colour sub-carrier frequency generation, thereby allowing the generation of the final video output.

Storage means such as low cost, high capacity hard disk drives and now being used for the recording and playback of audio and video data in BDRs. On occasions when video data is read from the hard disk drive of the BDR an accurate SCR is unavailable, as even though the stable reference signal relating to the video data can be recorded on the hard disk drive, upon play back it will have lost its accuracy. This is because it is being replayed under the control of the local VCXO frequency which is not a stable reference, rather than the SCR frequency it was originally

broadcast at. The VCXO frequency will typically drift in time and with temperature if not updated using SCR values embedded in the incoming off air data streams.

PAL decoders in televisions take composite video signals (i.e. video signals containing luminance, colour and synchronisation pulses which are generated by BDRs) from the video output of BDRs and recover the constituent red, green and blue components for display on the screen of the television or monitor. The PAL decoder in an average television can lock to a colour subcarrier frequency generated by the VCXO deviating by up to +/- 200Hz. This equates to +/-45ppm about the subcarrier frequency of 4.43361975MHz. If the free run frequency of the 27MHz VCXO deviates beyond this point, as it can do when an inaccurate PWM is generated due to the absence of a stable SCR value, it is possible for the PAL decoder to lose colour lock. This can result in colour loss to the image displayed on the display screen, which is undesirable. One possible solution to this is given in co-pending British Patent Application no.0023267.8.

A similar problem is encountered when playing back BDR recordings on a video cassette recorder (VCR), for example if the user is trying to clear hard disk space in the BDR by transferring data onto a VCR. VCR's are less tolerant to errors in colour carrier frequency than television systems and can introduce further errors to the recorded SCR. As such, when the recording has been transferred from the BDR to the VCR and the VCR is then played back on the display screen of the television system, the error in the colour sub-carrier frequency results in deviations in PWM greater than the PAL decoder of the television can lock onto. This results in colour loss of the image displayed on the display screen.

An aim of the present invention is to provide a method for the reliable generation of composite video signals when replayed from storage means of a BDR and/or a VCR.

According to a first aspect of the present invention there is provided a method for the production of a pseudo stable reference control for the reliable generation of composite video signals from a broadcast data receiver (BDR), said BDR having storage means in which to store digital data and wherein said method includes locking the locally generated reference within the BDR to an off air data stream and deriving a stable reference control embedded in said off air data stream, to generate a pseudo stable reference control for the playback of stored digital data from the BDR.

The stable reference control can be taken from either digital or analogue broadcast signals and, where a choice is possible, the more accurate reference is used. This is typically the colour sub-carrier frequency of an analogue television broadcast.

Preferably the BDR is provided with a microprocessor to extract and decode the stable reference control or system clock reference (SCR) embedded in the off air data stream and to discount the remaining data of the off air data stream.

In one embodiment the BDR has both analogue and digital reception capabilities and during playback of data from the BDR storage means, the BDR tunes/locks onto an analogue channel, deriving the SCR from the analogue channel. Preferably this is undertaken whilst the BDR is displaying the stored playback data.

In an alternative embodiment the BDR has digital reception only, either due to their being only digit reception capabilities

available or the analogue channel is already being used for a different function. In this embodiment the BDR tunes/locks onto a digital channel and derives the SCR from the digital data stream. Preferably this is undertaken whilst the BDR is displaying the stored playback data.

Preferably the BDR records and stores the extracted SCR from the off air data stream in storage means at pre-determined time intervals, such that if locking of the BDR to the off air data stream is lost during playback of the stored digital data from the BDR, the BDR can use the last recorded SCR to continue playback of the stored digital data without any loss of colour to the video output. Once locking of the BDR to the off air data stream is restored, the SCR is taken from the off air data stream rather than the last recorded SCR value.

In one embodiment the BDR is provided with means to watch and record different channels simultaneously. In this embodiment there may be more than one SCR value in the BDR, and rather than using two separate SCRs, which may result in errors in setting the VCXO of the BDR to the correct frequency, the method includes switching the front end of the record channel off, extracting the SCR from the data stream of the channel being watched and using the SCR within the record channel to lock the watch and record channels together.

Preferably if an analogue channel is available, i.e., is being displayed or recorded, then the SCR from this channel is used.

Further preferably if two analogue channels or one or more digital only channels are available, the SCR for the displayed channel is used.

Preferably the record channel can include a channel from which data is being recorded onto the VCR or BDR, a channel being used to play back video data from the BDR or a recording mode in which digital data is being copied from the BDR onto the VCR.

The advantages of the present invention are that it avoids the need for an expensive high stability free running oscillator to be used in the BDR. In addition, the effect of using a pseudo stable reference to drive the VCXO, which is based on a stable reference value obtained from an off air data stream, results in an accurate reference value being used to playback data from the VCR or BDR to provide an accurate colour video output. Any seasonal changes in temperature in the operating environment of the BDR are automatically compensated for.

An embodiment of the present invention will now be described with reference to the following description:

In normal operation of the present invention, when the BDR is required to playback digital data stored on its hard disk drive, either directly onto a television screen or indirectly via copying the digital data onto a VCR storage means, the BDR locks onto an off air data stream and derives a pseudo stable reference control value. This reference is based on the SCR embedded in the data stream. The extraction of SCR data is typically performed by a microprocessor in the BDR and the remaining data of the data stream is discounted. The microprocessor uses the derived SCR value to produce a suitable pulse width modulated (PWM) waveform to control the voltage controlled crystal oscillator (VCXO) of the BDR. The colour subcarrier frequency generated by the VCXO is then locked onto by the PAL decoder of the television to prevent colour loss of the image displayed on the television display screen.

In a similar manner, when digital data is being transferred from the BDR to a video cassette recorder (VCR), the BDR locks onto an off air data stream and derives a pseudo stable reference control based on the stable reference embedded in the off air data stream. The pseudo stable reference control value is then used to set the VCXO of the BDR to ensure that the digital data being copied onto the VCR has an accurate SCR value. This is particularly important as VCR's are less tolerant to errors in colour carrier frequency than television systems, and can introduce further errors to the VCR recorded SCR. Thus the pseudo stable reference prevents colour loss of images displayed on the television display screen from VCR data, which in turn has been recorded from BDR data.

The BDR records SCR values from off air data streams at pre-determined time intervals and stores these values in storage means of the BDR. In the event that during playback of stored digital data from the BDR, locking of the BDR to the off air data stream is lost, the BDR uses the last recorded SCR to continue playback of stored digital data without any loss of colour of the vide output. Once locking of the BDR onto an off air data stream is restored, the BDR reverts to deriving pseudo stable reference values from the SCR embedded in the off air data stream.

In the event that the BDR is provided with multi-tuners (i.e., has the ability to allow a channel to be watched whilst recording a different channel) at least two SCR values will typically be present in the BDR. This may result in an error in setting the VCXO to the correct frequency for either, or both, of the channels being recorded and watched. In order to prevent this error, the present invention provides means for switching the timing control SCR values of the record channel off. A pseudo stable reference is then derived from the SCR embedded in the

off air data stream of the channel being watched. This pseudo stable reference value is then used by the record channel to lock the watch and record channels together.

The recorded channel can include a channel from which data is being recorded onto a VCR or a BDR, a channel being used to play back video data from the BDR or a recording mode in which digital data is copied from the BDR onto the VCR.